Nondestructive Evaluation Program

X-ray Computed Tomography Image Quality Indicator (IQI) Development (CT IQI)

Completed Technology Project (2015 - 2019)

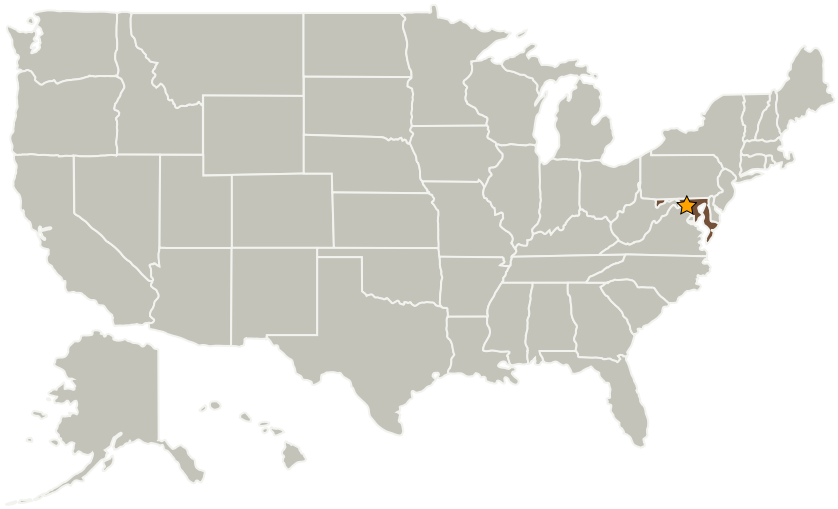
Project Introduction

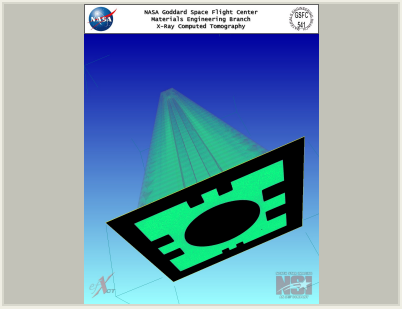
The intent of this project is to identify suitable x-ray Computed Tomography (CT) Image Quality Indicator (IQI) designs that can be used to adequately capture CT system performance. Customary IQI devices for 2D radiography are typically flat, and since the CT system implements geometric reconstruction using up to 360 degrees of incident angles, flat objects offer an unrealistic basis for a standard (unless the inspected part is of similar geometry). While some CT IQIs are commercially available (most geared for military or medical use), none are widely or universally accepted as standard. We aim to develop radially-symmetric IQIs, more consistent with NASA-related materials and inspection methods, that serve multiple purposes related to system performance evaluation.

Anticipated Benefits

These CT inspection tools will benefit all NASA centers with x-ray CT capabilities or x-ray CT inspection needs, as well as industry CT users. The benefit is the ability to use one common tool to assess system performance for a particular class of materials (such as plastics, aluminum, or titanium). The IQIs will be used to assess CT detectability limits, contrast sensitivity, and resolution. If additive manufacturing (AM) is utilized to generate the IQIs, a dual purpose, or secondary benefit to these IQIs is that the CT system may be used to ascertain AM material build defects and limitations.

Primary U.S. Work Locations and Key Partners





xCT image of Pyramidal External Line Pair IQI. Internal pocket will incorporate penetrameter discs for contrast sensitivity measurement.

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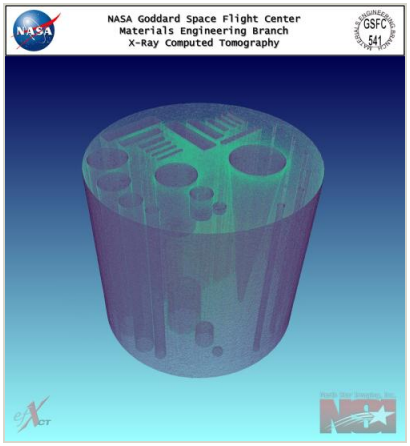
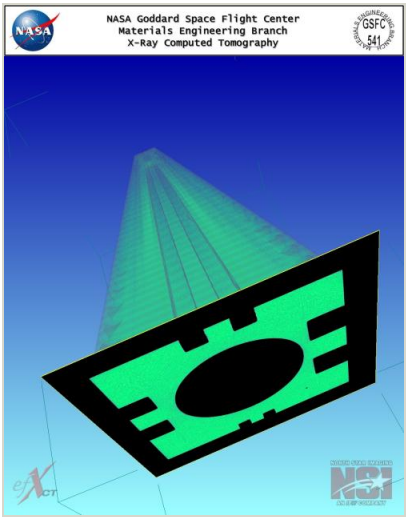
Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Images



CT of Original Concept IQI
X-ray CT image showing Original Concept Cylindrical Image Quality Indicator
(https://techport.nasa.gov/image/20725)



Pyramid IQI
xCT image of Pyramidal External Line Pair IQI. Internal pocket will incorporate penetrameter discs for contrast sensitivity measurement.
(https://techport.nasa.gov/image/33414)

Organizational Responsibility

Responsible Mission Directorate:

Office of Safety and Mission Assurance (OSMA)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Nondestructive Evaluation Program

Project Management

Program Director:

Terrence W Wilcutt

Program Managers:

Jeannette F Plante
Jason P Moore
Eric R Burke

Principal Investigator:

Justin S Jones

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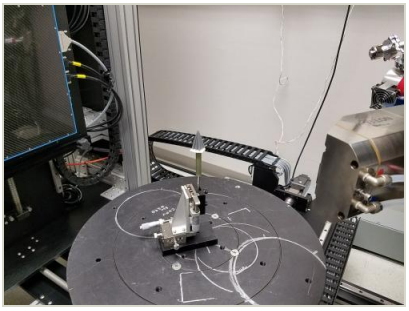


xCT Scan of the Pyramid IQI
xCT Scan of the Pyramid IQI
(https://techport.nasa.gov/image/33415)

Links

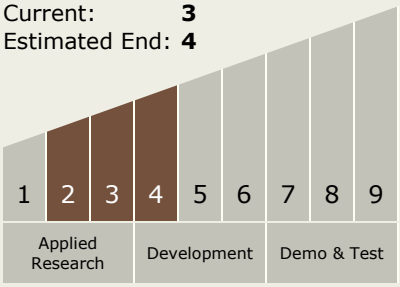
TechPort Public Export Approval
(https://stidaa-bsgweb1.ndc.nasa.gov/tracking/status/31112)

Project Website:

https://sma.nasa.gov/sma-disciplines/nondestructive-evaluation

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.5 Nondestructive Evaluation and Sensors

Target Destinations

Earth, Foundational Knowledge